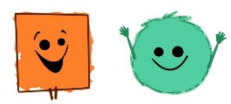
Estimation Study

Graph Comprehension
1. Literal reading the data
2. Reading between the data
3. Reading beyond the data

Rounding Errors & Anchoring Literature

Two Scenarios
Log2 vs Linear



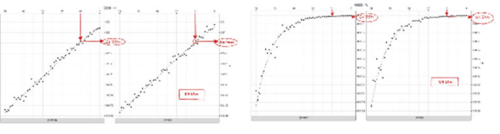
Data generation
Plot creation
Randomization (12 Q's)
302 Participants

Q0: Open Ended

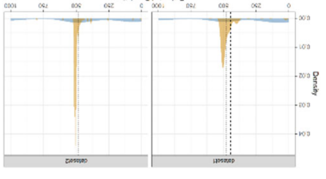
Linear Scale

Log2 Scale

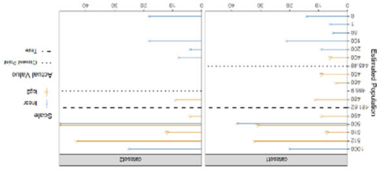
QE1: Estimate a population given a year



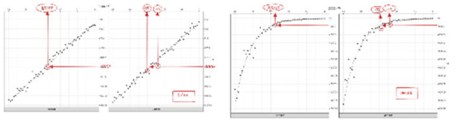
Linear variability > Log variability



Anchoring happens (500 vs 512)

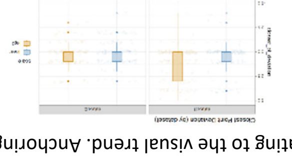


QE2: Estimate a year given a population



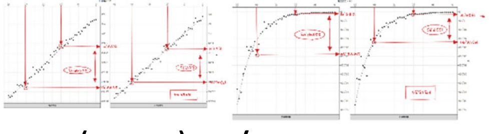
Participants are reading the data points, not basing estimates on the visual trend.

Exception where participants are overestimating – especially on log scale for dataset 1. Might be estimating to the visual trend. Anchoring to 4096?



Would like to conduct more research on participants ability to read between the y-axis tick marks on the logarithmic scale.

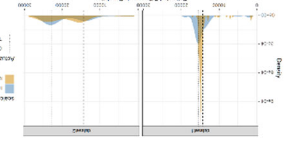
QI1: Estimate an increase in population between two years (additive)



Look at participant logic through Calculation & Scratchpad. A little all over.

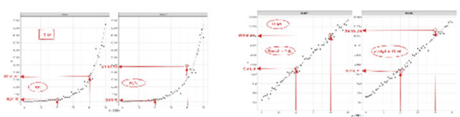
16384/2=8192; 16384+8192=24576; 1024/4=256; 1024+256=1280; 24576-1280=23296
40 ABY~ 24576
20 ABY ~1280
4520 ~= 1200
4540 ~= 26,000
26000/1200 = 21.7

Less variability on the log scale for data set 1. Tendency to underestimate from closest point and overestimate from true value.

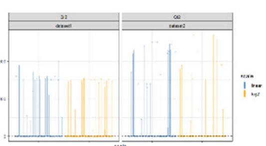


Anchoring & Estimation on points is strong:
- 16384 - 1024 = 15360, but that 15000 is still strong.
- Data set 2 has higher estimates

QI2: Estimate how many times larger the population is between two years (multiplicative)

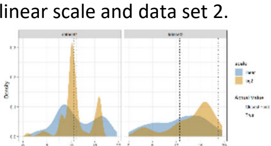


Lack of basic understanding of the logarithmic scale interpretation (maybe annotate a few select points)



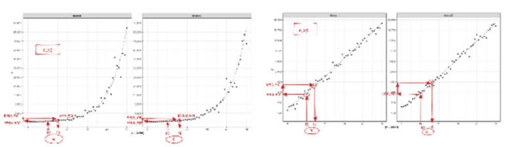
15000 is still a common point.

Larger variability on linear scale and data set 2.

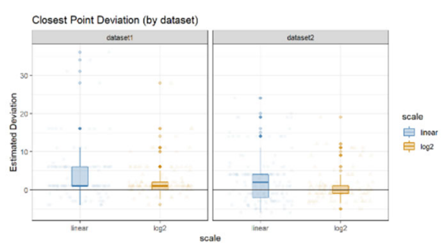


Anchoring:
16384/1024 = 16
25000/2500 = 10

QI3: Estimate how many years it takes for the population to double (multiplicative)



Linear variability > Log variability
Log scale is more accurate… maybe



Strong Anchoring at 5 and 10

Main Points

1. Understanding logarithmic logic is difficult.
   - Misunderstanding in QI1 and QI2.
2. Anchoring, anchoring, anchoring!
   - On the log2 scale, but the base 10 is still strong.
3. Participants were reading the data points rather than the trends, with a few exceptions. Differences in results across datasets.
4. Log vs Linear Scale
   - Linear scale had greater variability in general (not always)
   - Log scale was occasionally more accurate (doubling)
   - Dependent on the values being asked. Would want to test more values for each type of question.

Would like to code the calculation and scratchpad logic…does order of question matter (QI1 vs QI2)?

Would like to conduct more research on participants ability to read between the y-axis tick marks on the logarithmic scale. Might need to have smaller magnitudes to do this.